

Abstract

The SHARP Light Gas Gun

Due to the high sound speed in hydrogen, all velocity records are held by hydrogen gas guns. Gas guns have a long and successful history of aerophysics, lethality, and hypervelocity impact work.

The SHARP hypervelocity launcher is an unconventional two stage light gas gun. Besides its unprecedented size, its main distinguishing characteristic is its elevatable launch tube which was so designed to demonstrate gun launch to space. Though a sub-orbital launch has never been attempted, the system as currently configured could achieve an apogee of 450 km with a 5 kg projectile.

Since its first test in 1993, SHARP has seen application primarily as an aerophysics test facility. Gun launch has advantages over other techniques, offering integrated free-flight performance tests through "clean" air at high Mach and Reynolds numbers. SHARP is the only facility testing hypersonic air-breathing vehicles (i.e. scramjets) under these conditions. We have obtained fuel flow and ignition at velocities up to Mach 9, but no evidence of acceleration as yet.

SHARP has also been used for impact studies and has put record energies for the hypervelocity regime ( $> 20$  MJ) on target for lethality and cratering studies.

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